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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,198	01/20/2004	Katsuji Andou	247709US2	7758
22850	7590	02/03/2006	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			LE, THAO X	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 02/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/759,198	Applicant(s) ANDOU, KATSUJI	
	Examiner Thao X. Le	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5869883 to Mehringer et al. in view of US 5172213 to Zimmerman and US 6397935 to Yamamoto et al.

Regarding claim 1, Mehringer discloses in fig. 4 a semiconductor device which comprises a conductive heat sink 14, including an outer surface 14a/b including a plane partially formed thereof; a power semiconductor element 8 fixed onto the plane in the outer surface of the conductive heat sink 14 through a bonding layer 11; and an external connecting terminal 17, including an inner lead part including a tip portion bonded onto the plane in the outer surface 14a of the conductive heat sink 14 and an outer lead part 17 continuous with the inner lead part; and a mold resin 13 covering the surface of the power semiconductor element 8, the whole of the inner lead part of the external connecting terminal 17, and the outer surface 14a of the conductive heat sink 14.

But, Mehringer does not disclose a mold resin covers the whole surface of the power semiconductor element; and conductive heat sink comprising a conductive pipe including an inner surface forming an inner space shaping a path of refrigerant liquid.

However, Yamamoto discloses a semiconductive device comprises a semiconductor power device 71, fig. 11 col. 8 line 36, a conductive pipe 40, col. 6 line 25 fig. 4a, including an inner surface forming an inner space 25, col. 6 line 7, shaping a path of refrigerant liquid, col. 6 line 28. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to replace the conductive heat sink 14 of Mehringer with the heat pipe 40 teaching of Yamamoto, because it would have created a heat transferring path with high accuracy and could easily attached as taught by Yamamoto, see abstract.

With respect to the mold resin cover the whole surface of the power semiconductor; Zimmerman discloses a semiconductor device in fig. 5 comprises a power semiconductor element 12, a lead 48, and a mold resin covers the whole surface of the power semiconductor element. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the mold resin teaching of Zimmerman with Mehringer's device, because it would have provided the protection to device.

Regarding claim 2, Mehringer does not disclose the semiconductor device further includes an insulative film 42 formed in the whole of inner surface, the mold resin 22 resin covers the whole of conductive pipe, and includes a refrigerant liquid inlet continuous with one end portion of said conductive pipe and a refrigerant liquid outlet continuous with the other end portion of said conductive pipe.

However, Yamamoto discloses the semiconductor device insulative film 46 formed in the whole of inner surface, and a conductive pipe 40 includes a refrigerant liquid inlet continuous with one end portion of said conductive pipe and a refrigerant liquid outlet continuous with the other end portion of said conductive pipe, fig. 2B, fig. 3, fig. 12C. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to replace the conductive element 50 of Zimmerman with the heat pipe 40 teaching of Yamamoto, because it would have created a heat transferring path with high accuracy and could easily attached as taught by Yamamoto, see abstract.

With respect to the mold resin covers the whole power semiconductor element; see discussion in claim 1.

Regarding claim 3, Mehringer discloses a semiconductor device in fig. 4 comprising an insulative heat sink 14 including an outer surface 14a including a plane partially formed thereof; an external connecting terminal 17 including an

inner lead part including a pad part 18 bonded onto said plane in said outer surface 14a of said insulative heat sink 14 and an outer lead part 17 continuous with said inner lead part; a power semiconductor element 8 fixed onto said pad part 18 of said external connecting terminal 17 through a bonding layer 16; and a mold resin 13 covering the surface of said power semiconductor element 8, the whole of said inner lead part of said external connecting terminal 17, and said outer surface of said insulative heat sink.

But, Mehringer does not disclose the semiconductor comprising an insulative heat pipe including an inner surface forming an inner space shaping a path of refrigerant liquid; and an insulative pipe comprises a vertical section of a rectangular shape.

However, Yamamoto discloses a semiconductive device comprises a semiconductor power device 71, fig. 11 col. 8 line 36, a conductive pipe 40, col. 6 line 25 fig. 4a, including an inner surface forming an inner space 25, col. 6 line 7, shaping a path of refrigerant liquid, col. 6 line 28; and an insulative pipe comprises a vertical section of a rectangular shape, fig. 4C, 5B. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to replace the conductive heat sink 14 of Mehringer with the heat pipe 40 teaching of Yamamoto, because it would have created a heat transferring path with high accuracy and could easily attached as taught by Yamamoto, see abstract.

With respect to the mold resin cover the whole surface of the power semiconductor; Zimmerman discloses a semiconductor device in fig. 5 comprises a power semiconductor element 12, a lead 48, and a mold resin covers the whole surface of the power semiconductor element. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the mold resin teaching of Zimmerman with Mehringer's device, because it would have provided the protection to device.

Regarding claim 5, Mehringer discloses the semiconductor device wherein the power semiconductor element 8 is electrically connected to the inner lead part of the external connecting terminal 17 via the conductive heat sink 14, fig. 4.

Response to Arguments

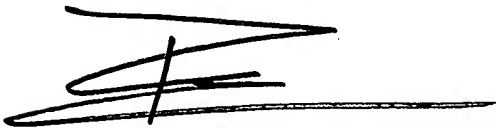
3. Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Thao X. Le', with a horizontal line extending to the right.

Thao X. Le
30 Jan. 2006